HEADQUARTERS

Wright Air Development Division

AIR RESEARCH AND DEVELOPMENT COMMAND
UNITED STATES AIR FORCE
WRIGHT-PATTERSON AIR FORCE BASE, OHIO

8 DEC 1960

REPLY TO ATTN. OF: WWDPSP-3/Mr. Carroll/22113

SUBJECT: Experimental Multi-Stage Personnel Parachute

STATINTL TO: ARDC (RDGB, [redacted])
Andrews AFB
Wash 25 DC

1. On 20 and 21 September 1960 four live parachute jumps were accomplished in collaboration with the 6511th Test Group, El Centro, California, under a test program identification of FTL 225B.

2. A general description of the parachute used on these tests with an analysis of malfunctions which occurred is attached herewith.

3. It is doubtful, at this time, that the deficiency outlined in Attachment 1 can be overcome by a simple design or rigging alteration. It appears necessary to redesign the main canopy sleeve and bag locking system to resist wind and acceleration forces imposed upon it and conduct a series of static and aerial tests to establish reliability.

FOR THE COMMANDER:

W. L. LEVERETTE
Colonel, USAF
Chief, Operational Support
Engineering Division

1 Atch
Description of Prcht w/Analysis
of Malfunctions

On file USAF release
instructions apply.

DESCRIPTION OF PARACHUTE
WITH ANALYSIS OF MALFUNCTIONS

1. Following is a general description of the parachute used on these jumps:

a. The outward appearance of the parachute resembles a standard Air Force back style parachute.

b. The pack is modified and enlarged to accommodate two parachute canopies (first stage and main), two automatic ripcord releases, a special deployment bag (with sleeve), and added actuation controls.

c. The harness is modified to incorporate a dual suspension system, reserve parachute attachment facilities, and additional actuation and release control hardware.

d. The main canopy is modified so that deployment of the upper half of the canopy may be arrested about midway from the apex to the skirt to act as an integral suspension member between the man and the first stage canopy. The lower half of the canopy is restrained during first stage operation by the special bag and sleeve.

e. The first stage canopy is a guide surface design approximately 6 feet in diameter, with a highly porous vane suspension system permanently attached to the apex of the main canopy.

f. One automatic ripcord release is a standard Type F-1B with modified housings and cables. The second release is also basically standard with the aneroid control section removed to facilitate its use purely as a time delay actuator.

g. The dual harness riser system utilizes four standard Type J-1 canopy releases, two of which are modified for linkage with the second stage F-1B release to form an automatic first stage parachute cutaway system. The other two J-1 releases are used in the second (main) stage risers in a normal manner primarily for protection against ground dragging.

2. The parachute described above was developed specifically for use on Project Excelsior (Kittinger balloon jump) and the conditions of reliability testing have been limited to those expected during "Excelsior" plus certain extended maximum conditions to establish a safety factor.

3. The conditions of the tests cited were not expected to exceed those for which the parachute was designed. However, due to the highly special design of the parachute and the lack of a detailed servicing manual on

Atch 1

the complicated rigging procedure, it was recommended by Wright Air Development Division that a rigger with the necessary experience accompany the parachutes during test. A rigger with experience gained during the multi-stage parachute development program and throughout Project Excelsior was dispatched to El Centro with the parachutes.

4. On the third and fourth jumps of the parachute on 21 September 1960, malfunctions occurred as described below:

a. The first jumper made a satisfactory exit from a C-130 at 30,000 feet. After approximately 12 seconds of free-fall the first stage parachute deployed automatically. Upon trying to check the first stage the jumper reported (a) that excessive billowing of the trailing main canopy hid the first stage from view, (b) that torn edges of the main canopy could be seen, and (c) that the main risers were out of the pack.

b. The jumper manually released the first stage at 14,000 feet, allowing the main to deploy and inflate. The main canopy suffered major damage to three gores adjacent to the first stage attachment patches, with numerous small friction burns and tears in the same general area. The main inflated fully; however, the jumper elected to deploy his reserve and jettison the main at 3,000 feet due to suspected excessive descent rate. The jumper landed without injury.

c. The second jumper had a similar experience as the first, except as follows:

(1) He did not report seeing a torn trailing main canopy.

(2) He rode the first stage down to 6,400 feet where the first stage released automatically and the main deployed.

(3) The main canopy suffered less damage than on the first jump (one blown gore and numerous small friction burns and tears); however, a major loss in drag resulted from an apparent "Mae West" line over and line entanglement. Entangled lines converged more than half way up from the man.

5. A study of motion pictures and the first jumper's comments indicate that the malfunction resulted from a premature release of the normal sleeve and bag envelopment of the main canopy. Premature release of the restrained portion of the main could have occurred (in both jumps) any time after the first stage opened; however, the extensive line entanglement on the second jump (long first stage fall) and little or no line entanglement on the first jump (shorter first stage fall) indicates that early premature release of the restrained portion of the main is most likely to have occurred.

6. By careful simulation of first stage deployment on the bench it was found that the main canopy sleeve and bag are prone to premature release due to the following:

a. Acceleration of the mass of the sleeve and bag enveloped portion of the main canopy, as a result of snatch force, causes a sufficient strain on break cord lacings to cause failure and subsequent freeing of the lower restrained portion of the main canopy.

b. Whipping forces from the wind acting on the trailing portion of the main canopy can also cause sufficient strain on lacings to cause failure.